

WHAT IS CLAIMED IS:

1. A hydrocarbon sensor comprising a substrate made of a solid electrolyte that conducts protons, and a pair of electrodes formed on the substrate,  
5                    wherein at least one electrode of the pair electrodes contains Au and Al, and  
                     assuming that a content of an Al simple substance in the at least one electrode is "a" mol%, and a content of aluminum oxide in the at least one electrode is "b" mol%, "a" and "b" satisfy a relationship:  $a + 2b \leq 7$ .  
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2. A hydrocarbon sensor according to claim 1, wherein the at least one electrode contains at least one metal selected from the group consisting of an AuAl<sub>2</sub> alloy and an Au simple substance in a ratio of at least 50 mol%.
- 15    3. A hydrocarbon sensor according to claim 2, wherein the at least one electrode contains AuAl<sub>2</sub> and an Au simple substance in a molar ratio of AuAl<sub>2</sub> : Au = X : 1-X, where  $0.6 \leq X \leq 1$ .
- 20    4. A hydrocarbon sensor comprising a substrate made of a solid electrolyte that conducts protons, a pair of electrodes formed on the substrate, and leads connected to the electrodes,  
                     wherein at least one electrode of the pair of electrodes contains Au and Al, and  
                     the at least one electrode and the lead are connected to each other via  
25    a conductive adhesive containing Pt and Au or a conductive adhesive containing Al and Au.
- 30    5. A hydrocarbon sensor according to claim 4, wherein the at least one electrode and the lead are connected to each other via a conductive adhesive containing Al and Au, and  
                     a component of the at least one electrode is the same as a component of metal contained in the conductive adhesive.
- 35    6. A method for producing a hydrocarbon sensor including a substrate made of a solid electrolyte that conducts protons, and an electrode formed on the substrate, comprising coating the substrate with a paste containing Au particles and Al particles, followed by baking, thereby forming the electrode

containing Au and Al.

7. A method for producing a hydrocarbon sensor according to claim 6, wherein  
a content of an Al simple substance in the electrode immediately after baking  
5 is 7 mol% or less.

8. A method for producing a hydrocarbon sensor according to claim 6, wherein  
the baking is conducted in an oxygen-free atmosphere.

10 9. A method for producing a hydrocarbon sensor according to claim 8, wherein  
the oxygen-free atmosphere is composed of at least one gas selected from the  
group consisting of nitrogen gas, argon gas, helium gas, and hydrogen gas.

15 10. A method for producing a hydrocarbon sensor including a substrate made  
of a solid electrolyte that conducts protons, an electrode formed on the  
substrate, and a lead connected to the electrode, comprising connecting the  
electrode to the lead via a conductive adhesive, followed by baking in an  
oxygen-free atmosphere,  
20 wherein the electrode contains Au and Al.

11. A method for producing a hydrocarbon sensor according to claim 10,  
wherein the conductive adhesive contains Pt and Au or contains Al and Au.

12. A method for producing a hydrocarbon sensor according to claim 10,  
25 wherein the oxygen-free atmosphere is composed of at least one gas selected  
from the group consisting of nitrogen gas, argon gas, helium gas, and  
hydrogen gas.